Pullout capacity of block anchor in sand

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Abstract

This research studies the pullout capacity of block anchor using experimental works, analytical calculation and numerical computation. This research has studied the effect of various parameters on the pullout capacity of block anchor embedded in clean sand. These parameters are: width and thickness of the block, depth (thickness) of cover, location of pullout load, and moisture condition of the sand. The experimental results are compared with the analytical calculations from Rankine, Coulomb, and log spiral theories, and also with the numerical computations using Plaxis program (for the 2-D cases). The 3-D effect is also considered.

The experimental work simply consists of a pullout test, which exerts a horizontal force through a steel cable on a concrete block anchor embedded in sand. The sand is deposited in a 1200 x 600 x 800mm box using a pluviation method to ensure uniform and reproducible density. For comparison purposes a plate anchor was also tested. The load and the corresponding horizontal and vertical displacements were recorded. In addition, visual observations were made for the failed soil body. Materials used were characterized to find their properties and the equipments used were calibrated before usage.

The block anchor was found to have higher pullout capacity than a plate anchor (for the same width and height). Moisture condition was proven to be significantly affecting the pullout capacity. The location of pullout load does not significantly affect the pullout capacity. The Rankine theory corrected for the 3-D effects plus frictions were found to have close agreement with the experimental results. In addition, results from Plaxis program gives good prediction and agreement for the 2-D cases.